

WHAT IS CLAIMED IS:

1. A steam turbine comprising:

an outer housing;

a turbine shaft rotatably supported in said outer housing; and

a plurality of turbine stages located along said turbine shaft and contained within said outer housing, each said turbine stage comprising:

a diaphragm attached to the casing, said diaphragm comprising a plurality of nozzles;

a rotor fixedly attached to said turbine shaft, said rotor comprising a plurality of buckets and a bucket cover; and

a packing ring mounted in a first circumferentially extending groove in said diaphragm, said packing ring comprising a seal shroud and a sealing means, said packing ring positioned adjacent said turbine shaft to provide a seal in a gap between said turbine shaft and said diaphragm;

said seal shroud fabricated from a first material having a first coefficient of expansion, said diaphragm fabricated from a second material having a second coefficient of expansion, said first and second materials selected so that at a first temperature said gap between said turbine shaft and said diaphragm is larger than at a second higher temperature.

2. A turbine in accordance with Claim 1 further comprising a spill-strip seal ring mounted in a second circumferentially extending groove in said diaphragm, said spill-strip seal ring comprising a seal shroud and a sealing means, said spill-strip seal ring positioned adjacent said bucket cover to provide a seal in a gap between said bucket cover and said diaphragm;

said seal shroud of said spill-strip seal ring fabricated from a third material having a third coefficient of expansion, said third material selected so that at

a first temperature said gap between said bucket cover and said diaphragm is larger than at a second higher temperature.

3. A turbine in accordance with Claim 1 wherein said packing ring sealing means comprises at least one of a plurality of seal teeth and a brush seal.

4. A turbine in accordance with Claim 2 wherein said spill-strip seal ring sealing means comprises at least one of a plurality of seal teeth and a brush seal.

5. A turbine in accordance with Claim 1 wherein said coefficient of expansion of said second material is larger than said coefficient of expansion of said first material.

6. A turbine in accordance with Claim 2 wherein said coefficient of expansion of said second material is larger than said coefficient of expansion of said third material.

7. A turbine in accordance with Claim 6 wherein said coefficient of expansion of said first material is larger equal to said coefficient of expansion of said third material.

8. A turbine in accordance with Claim 1 wherein said coefficient of expansion of said second material is less than said coefficient of expansion of said first material.

9. A turbine in accordance with Claim 2 wherein said coefficient of expansion of said second material is less than said coefficient of expansion of said third material.

10. A turbine in accordance with Claim 9 wherein said coefficient of expansion of said first material is larger equal to said coefficient of expansion of said third material.

11. A diaphragm for a steam turbine, the turbine comprising a rotatable shaft and at least one rotor fixedly attached to the shaft, the rotor comprising a plurality of buckets and a bucket cover, said diaphragm comprising:

a plurality of nozzles; and

a packing ring mounted in a first circumferentially extending groove in said diaphragm, said packing ring comprising a seal shroud and a sealing means, said packing ring configured to be positioned adjacent the turbine shaft to provide a seal in a gap between the turbine shaft and said diaphragm;

said seal shroud fabricated from a first material having a first coefficient of expansion, said diaphragm fabricated from a second material having a second coefficient of expansion, said first and second materials selected so that at a first temperature the gap between the turbine shaft and said diaphragm is larger than at a second higher temperature.

12. A diaphragm in accordance with Claim 11 further comprising a spill-strip seal ring mounted in a second circumferentially extending groove in said diaphragm, said spill-strip seal ring comprising a seal shroud and a sealing means, said spill-strip seal ring configured to be positioned adjacent the bucket cover to provide a seal in a gap between the bucket cover and said diaphragm;

said seal shroud of said spill-strip seal ring fabricated from a third material having a third coefficient of expansion, said third material selected so that at a first temperature the gap between the bucket cover and said diaphragm is larger than at a second higher temperature.

13. A diaphragm in accordance with Claim 11 wherein said packing ring sealing means comprises at least one of a plurality of seal teeth and a brush seal.

14. A diaphragm in accordance with Claim 12 wherein said spill-strip seal ring sealing means comprises at least one of a plurality of seal teeth and a brush seal.

15. A diaphragm in accordance with Claim 11 wherein said coefficient of expansion of said second material is larger than said coefficient of expansion of said first material.

16. A diaphragm in accordance with Claim 12 wherein said coefficient of expansion of said second material is larger than said coefficient of expansion of said third material.

17. A diaphragm in accordance with Claim 16 wherein said coefficient of expansion of said first material is larger equal to said coefficient of expansion of said third material.

18. A diaphragm in accordance with Claim 11 wherein said coefficient of expansion of said second material is less than said coefficient of expansion of said first material.

19. A diaphragm in accordance with Claim 12 wherein said coefficient of expansion of said second material is less than said coefficient of expansion of said third material.

20. A diaphragm in accordance with Claim 19 wherein said coefficient of expansion of said first material is larger equal to said coefficient of expansion of said third material.